JACKSON ASSOCIATES WHITE PAPER

Reducing Customer Acquisition Costs and Sales Cycles in the Commercial Battery Storage/PV Market

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About the Author

Dr. Jerry Jackson is leader and research director of the Smart Grid Research Consortium and president of Jackson Associate, a consulting firm providing new technology analysis, market analysis, strategy development and other energy-related practice areas for over 30 years. He has also held positions as a professor at Texas A&M University, Chief of the Applied Research Division at Georgia Tech Research Institute, economist at the US Department of Energy's Oak Ridge National Laboratory and economist at the Federal Reserve Bank of Chicago.

He has advised new technology companies on market analysis, sales and market strategy for a variety of new energy technologies including electric and thermal energy storage, fuel cells, solar PV, combined heat and power, wind, flywheels, demand response, energy efficiency and smart grid technologies.

He is also developer of Jackson Associates' MAISY® Utility Customer Energy Use and Hourly Loads Databases, the most widely used source of utility customer energy use and hourly loads data comprised of information on more than 7 million utility customers. MAISY (Market Analysis and Information System) clients include technology companies, electric utilities, regulatory agencies, state and federal government agencies, research organizations and a variety of other clients. A partial list of clients is available at http://www.maisy.com/clients.htm

Introduction

Residential solar installations continue to increase at an exponential rate, growing nationally by 69 percent in the most recent Solar (SEIA) year-over-year comparison. By contrast commercial sector PV installations increased by about 4 percent over the same period. [1] The non-standard nature of commercial applications and financing requirements, installation issues with flat roof tops and smaller relative cost savings potentials because of commercial demand charges make most mass-market commercial applications much less attractive financially than residential applications.

In addition, commercial applications reflect higher customer acquisition costs (CAC) compared to residential customers. A typically lengthy commercial decision-making process, importance of alternative investments (e.g., marketing and advertising) and the fact that energy costs are typically dwarfed by labor and other operating costs make the PV sales process long and resource intensive. Consequently, solar PV mass marketing efforts have concentrated almost exclusively on residential applications.

The recent arrival of battery/PV systems promises to dramatically focus new PV marketing attention on commercial establishments. A battery/PV combination can increase electric bill savings by more than the sum of the individual technology contributions. This "total is more than the sum of its parts" result is demonstrated with actual building loads data in a later section of this paper.

The commercial sector is large; for example there are more than 500,000 commercial buildings in California. Average commercial customer electricity use is nearly 30 times greater with rooftop areas about 15 times greater than the average residential customer providing substantially greater potential economies of scale and profits. In addition, commercial properties often have parking and other areas suitable for elevated PV structures.

However, even with the extra financial benefits of combined battery/PV systems, commercial customer marketing is still extremely challenging because of high customer acquisition costs and long sales cycles described above.

This paper describes marketing analytics that can be used by battery/PV providers to significantly reduce commercial CAC costs and accelerate the sales cycle.

Demand Charges and Battery/PV Economics

It is important to distinguish between two general rate classes when considering battery and PV economics. Non-demand rates are typically applied to residential and small commercial customers with charges only for total electricity (kWh) used in the month. Two typical non-demand rate structures include kWh charges that vary by time periods in the day (time-of-use-rates) and tiered rates that vary by total kWh use in the month.

With non-demand rates, financial benefits of battery systems can only be achieved under a time-of-use rate structure where financial benefits are a result of reducing electricity use in on-peak and/or partial peak periods and recharging batteries in off-peak periods.

Demand rates include a demand charge (charge for the maximum monthly KW used in a 15-minute period during peak hours, typically noon to 6 pm in California) as well as an energy charge (cost for monthly kWh used). The

[1] SEIA provided statistics for "nonresidential customers" which consist of commercial and industrial customers. Industrial customers account for 5 percent of all nonresidential establishments and 9 percent of nonresidential establishments with more than 10 employees in California, so the SEIA figure overwhelmingly reflects commercial customers, the focus of this paper.

demand charge can be as much as 40 to 50 percent or more of the monthly bill, depending on the relationship between energy used and peak demand. Energy charges can be time of use, tiered or flat rates.

Under demand rates, the energy charge ($/kWh) is much smaller than under non-demand rates. Non-demand rates are designed to cover utility fixed and variable costs with a single rate based on electricity use in the month. Demand rate structures include fixed cost charges in demand rates ($/peak kW) and variable costs in a separate monthly electricity use rate ($/kWh). Consequently the energy rate for non-demand rates is less than the energy rate for demand-based rates. For example, Southern California Edison summer energy charge for small non-demand GS-1 customers is $0.19/kWh while the energy charge for medium and large customers in rate class GS-2 is $0.09/kWh. The demand charge for GS-2 customers of $21/kW makes up for the smaller energy charge.

Medium and large commercial customer solar-PV-only systems reduce the energy component of the monthly bill but may not reduce the demand charge significantly because of variability in PV output during peak periods throughout the month. This limited electricity bill impact makes the business case for demand metered commercial customers even less attractive than for non-demand customers which, along with CAC costs, explains why PV systems have been an unattractive market segment in the past for PV firms.

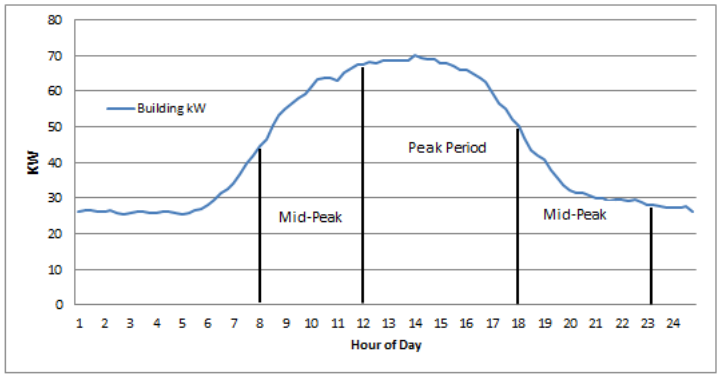
However, combining battery storage with PV provides a new source of electricity bill savings for these customers by smoothing peak period loads and clipping/shifting peak period loads to minimize demand charges. **In fact, combining battery storage and PV reduces peak demand charges more than the sum of peak savings from battery storage and PV systems independently.**

Battery Storage-PV Synergy

This section illustrates why a battery/PV system is more than the sum of its parts. Consider August peak day 15-minute loads for a medical office building in a moderate climate zone in the SCE service territory shown in Figure 1. This load profile was taken from the Southern California Edison MAISY Utility Customer Database.

The noon to 6 pm peak period and the mid-peak periods of 8am to noon and 6pm to 11pm are identified in the figure.

The Figure indicates that building loads begin to increase between 6 and 7 am and reach a peak around 2:30 pm. The saw-tooth nature of the load profile reflects HVAC motors cycling off and on and intermittent equipment loads. Loads begin dropping dramatically at 5:00 pm and begin plateauing around 8pm.

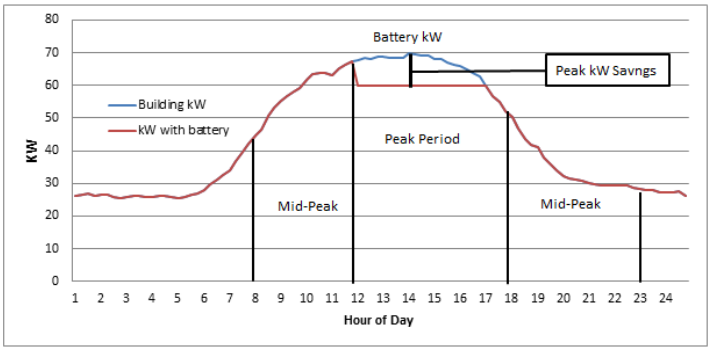


Source: MAISY utility Customer Energy Use and Hourly Load Database

Next consider applying a battery storage system with a maximum discharge of 10 kW and 50 kWh shown in Figure 2. The application in Figure 2 reduces peak demand by 10 kW and reduces energy use by 46.4 kWh. Note that the battery system reduces the spikes in the 15-minute loads and drops building loads to a constant 60 kW.

Source: MAISY utility Customer Energy Use and Hourly Load Database

Figure 2. Loads With Battery Storage

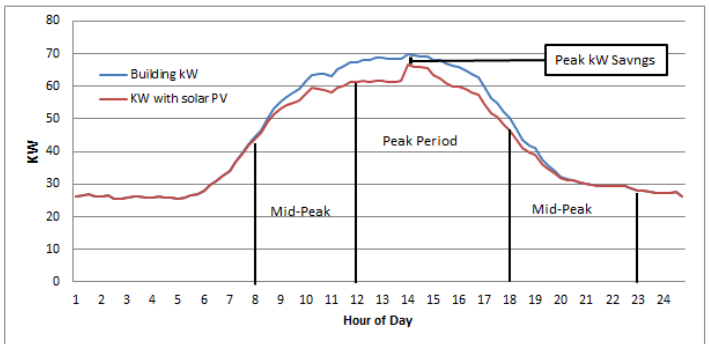


Next consider a PV system with output of 10kW shown in Figure 3.

On this peak day there was heavy cloud cover for a little over an hour beginning at 2pm causing a blip in loads with the PV system. While the PV system reduced energy use on this peak day by 51 kWh, peak demand was reduced by only 3.4 kW because of the erratic PV output.

Source: MAISY utility Customer Energy Use and Hourly Load Database

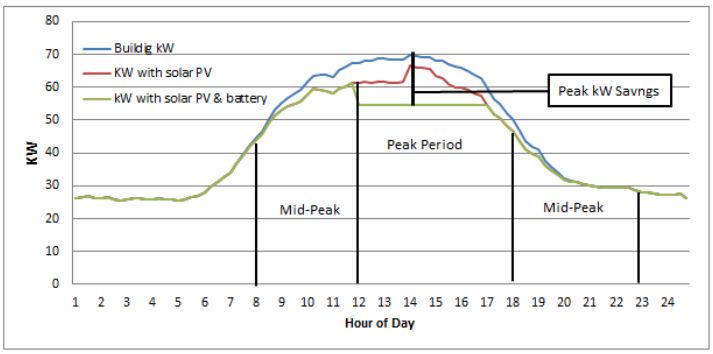
Figure 3. Loads With PV



Finally consider a combined battery/PV system in Figure 4. The battery system removes the blip in the PV contribution and reduces peak demand to 54.6KW

Source: MAISY utility Customer Energy Use and Hourly Load Database

Figure 4. Loads With a Battery/PV System



Results of the three systems are shown in Table 1. The synergy derived by applying battery storage and PV results in a total peak kW savings of 15.4 kW which is 2kW more than the sum of the individual battery and the PV kW savings. The battery was able to reduce the solar radiation fluctuation that was the limiting factor in the PV peak reduction and still lower building kW in the peak period to a new low of 54.6 kW.

The rightmost column shows August peak demand savings of $323 for the combined battery/PV system , $42 more than the sum of savings from the individual battery and the PV systems ($210+$71=$281).

Table 1. Results of Battery, PV and Battery/PV Systems

	Peak kW	Peak kW Savings	kWh Battery Savings	Kwh PV Savings	Total kWh Savings	August Peak Demand Savings (@ $21/kW)
Baseline	70.0					
Battery	60.0	10.0	46.4		46.4	$210
PV	66.6	3.4		51.2	51.2	$71
Battery & PV	54.6	15.4	46.4	51.2	97.6	$323

The battery-PV synergy illustrated above explains why the sweet spot for combined battery/PV systems is with medium and larger customers whose rates include a demand charge. The potential market for these systems is large. For example, Southern California Edison (SCE) requires commercial customers with peak demand greater than 20 kW to be on a demand-based rate. A 5,000 square feet office building would have a peak demand of about 20 kW. The SCE GS-2 rate schedules, which include customers from 20kW to 200kW include more than 100,000 customers.

Central Role of Customer Load Profiles

Customer electric loads along with technology and utility rate characteristics are the primary determinant of battery/PV systems financial benefits. A customer's financial benefits will be greater:

- The greater the random 15-minute load fluctuations (these typically range from about 2 percent to 15 percent of the hourly average)
- The more peaked the load profile is in peak period hours
- The more peak period loads are weather sensitive
- The more variation there is in solar PV output during peak period hours

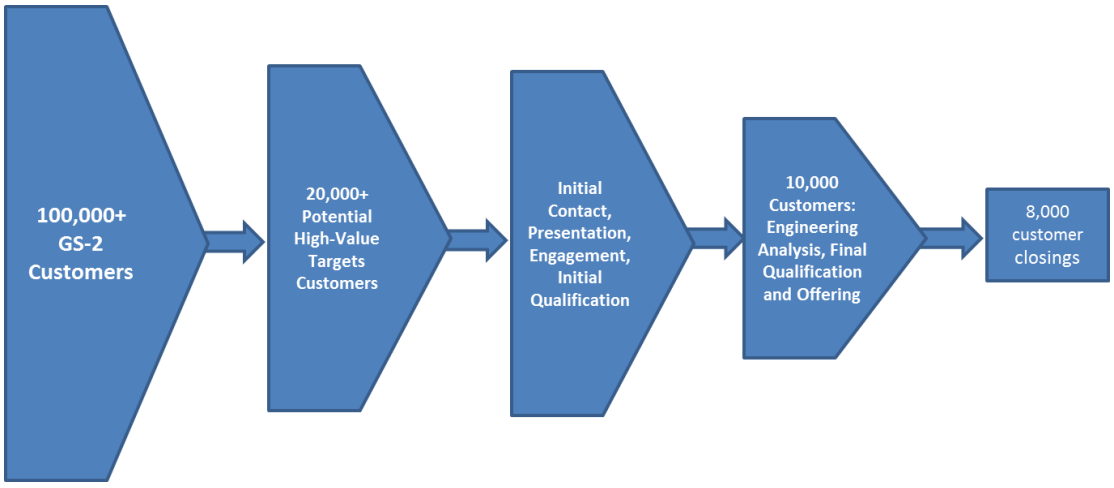
Targeting commercial customers with these load characteristics will significantly increase battery/PV system business case.

Bottlenecks in the Battery/PV Sales Funnel

Sales funnels are a conceptual representation of how the universe of potential customers is narrowed down to actual closed sales. They are useful constructs for organizing and assessing the entire marketing and sales process. Developing a sale funnel requires identifying each step in the process and evaluating the effectiveness with which eventual customers move through the process.

A battery/PV supplier's sales funnel using data from the SCE GS-2 demand-metered commercial customers might look like that presented in figure 5.

Figure 5. Battery/PV Sales Funnel

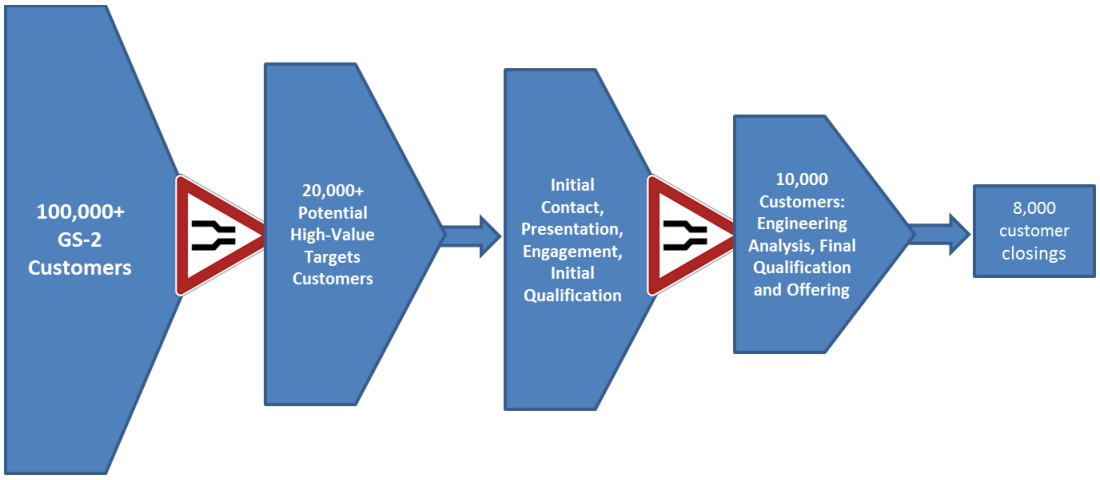


The figure shows a universe of 100,000+ commercial customers that is narrowed to 20,000 most attractive potential customers with an initial contact, sales presentation and initial qualification including preliminary system analysis

presented to these customers. About half of the initial 20,000 contacts lead to more extensive customer interaction, detailed engineering analysis, final qualification and customer offering. The process is expected to result in 8,000 customer installations.

Conversations with a number of companies in this space identifies several sales funnel bottlenecks that exert greater than expected time and money to overcome. These bottlenecks are illustrated in Figure 6.

Figure 6. Battery/PV Sales Funnel



The two serious bottlenecks reflect difficulty in:

1. Identifying the 20 percent of GS-2 customers who represent attractive sales prospects, and
2. Engaging and qualifying the 10 percent best GS-2 sales prospect

These two bottlenecks are the primary reasons why commercial customer acquisition costs are so high and why PV and battery/PV sales cycles can take a year or more and cost so much.

Bottleneck #1: Identifying and Targeting Attractive Sales Prospects

Accurate segmentation is the key to narrowing the population of customers to those most likely to be receptive to battery/PV provider sales presentations. Market segments are defined as groups of customers with similar characteristics and preferences. Target segments are those most likely to have the highest sales conversions and the lowest customer acquisition costs.

Traditional customer characteristics available from customer list providers (e.g., credit ratings, years in business, etc.) play an important role in identifying and targeting customer segments. However, each customer's load profile is the most important determinant of battery/PV financial benefits and one of the most important determinants of the customer's willingness to buy.

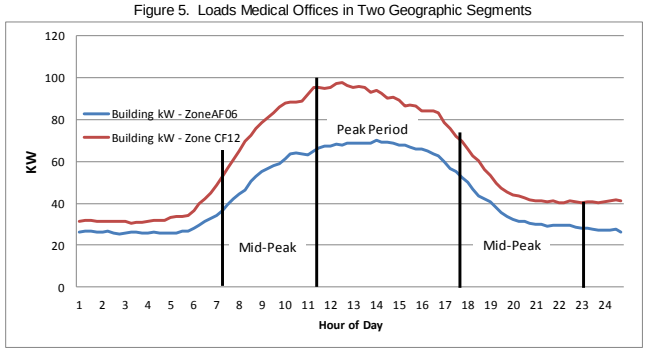
Commercial customer segment definitions related to load characteristic include:

- Business type
- Customer size
- Climate characteristics
- Rate class, and
- A variety of load characteristics including

- Degree of peak period "peakedness"
- Load Shifting opportunities
- Peak clipping opportunities
- Within-hour 15-minute load variations and load smoothing opportunities
- Load profile "fit" for alternative battery and PV system designs.

Battery/PV bill savings vary significantly across segments. For example, Figure 5 shows 15-minute loads for the medical office building segment shown in the previous section (lower blue line) and in a different SCE geographic zone (Zone CF12, higher red line). The building in Zone CF12 has a more peaked shape and more 15-minute load fluctuations providing an even greater potential for reducing peak demand charges.

Figure 5. Loads Medical Offices in Two Geographic Segments



Source: MAISY utility Customer Energy Use and Hourly Load Database

Market segmentation, profitability analysis and customer targeting requires analysis of a comprehensive database of customer hourly load data like that available in the MAISY Utility Customer Energy Use and Hourly Loads data used in this paper.

Effective customer targeting provides benefits in two specific areas.

Initial direct marketing contact identification. Mass marketing through most media outlets (radio and TV) is an ineffective and costly option for reaching commercial customers. Non-selective direct marketing through mail, telephone or in-person contacts is expensive as well because of low response rates and poor quality responses. Market segment analysis and target marketing can cut these marketing costs by as much as 80 percent over non-selective mass-marketing strategies.

Low conversion rates. Non-selective mass marketing generates responses from potential customers who are eventually found to be unattractive customers either because of their business/financial profiles or because of an unattractive business case. Significant marketing and sales resources can be expended on these customer often ending in late stage sales failures.

Bottleneck #2: Engaging and Qualifying Sales Prospect

Commercial sales cycles are notoriously long, requiring as much a year or more. A large part of the delay in closing sales is a result of the second bottleneck that occurs during the initial sales contacts and customer engagement process required to demonstrate the business case to the battery/PV provider and to engage and receive a commitment of interest from the customer.

Potential customers must be "qualified" on initial contact to determine the likelihood that an application of the technology provides an attractive business case. One of the most important inputs in the qualification is developing information on the customer's hourly or 15-minute electric loads which are typically not available in initial sales contacts. Weeks or a month or more may be required to gain customer permission and to obtain load data from the electric utility.

Commercial battery/PV providers can follow the lead of residential PV vendors by providing "real-time" preliminary estimates of battery/PV electric bill savings using peer-customer load characteristics instead of going through the traditional lengthy customer engagement and qualification process. Customer information on business type, operating hours, building occupants, etc. can be matched with customer characteristics in a commercial

customer interval load database to extract 15-minute interval load data that can be used in a preliminary business case analysis.

The ability to provide a preliminarily business case assessment keyed to customer characteristics in the initial meeting avoids investing additional time with customers who have marginal or poor business cases and immediately engages high-value customers with a concrete characterization of potential electricity bill savings. The ability to move quickly on high-value applications can significantly increase sales conversion rates.

In summary, this real-time assessment/preliminary sales proposition provides two primary benefits including:

- An immediate go-no go decision process for vendors and customers, significantly increasing sales conversions and reducing customer acquisition costs,

- Customer engagement and preliminary commitment from first contact, significantly reducing the time required to fully engage decision-makers and increasing sales conversions.

MAISY Marketing Analytics Solution #1: Segmentation and Customer Targeting

Jackson Associate's MAISY* Marketing Analytics provides market segmentation, sizing, profitability analysis and scoring, customer contact information and other segmentation and targeting data and sales support.

MAISY Utility Customer Energy Use and Hourly Loads Databases, utility rate structures and technology characteristics are applied to identify and prioritize target segments. Technology and profitability scoring append scores to individual customer contact records to focus marketing and sales efforts on the most receptive and profitable potential customers.

MAISY databases, developed with information on more than 7 million utility customers across the US, are the leading utility customer loads data source and the only comprehensive database to provide 15-minute loads. MAISY clients include leading solar and distributed energy companies including Geostellar, Sun Edison, Sungevity, Sharp Laboratories of America, Toyota, Ingersoll Rand, United Technologies, Bloom Energy, Ice Energy, Aisen and many more. A partial client list is available at http://www.maisy.com/clients.htm

Analysis is customized for each client application with results and data provided in Excel workbooks. An example of loads and bill analysis is shown in the Figure 6.

Figure 6. Example Segment Loads and Bill Analysis

SIC ****

	Zone 1	Zone2	Zone 3
Number of Customers	581	532	286.6
Mean Floor Space	25,589	36,426	36952.3
Mean Employment	22	36	37
Peak kW	48	58	88
Annual kWh	210,240	226,704	231264
Mean Annual Elec Bill	$ 25,891	$ 29,006	35133.12

15-Minute kW Loads

Day-of-year	Month	Day-of-month	Day-of-week	Hour	Zone 1	Zone2	Zone 3
1	1	1	3	1	21.8	21.4	19.8
1	1	1	3	1	21.9	21.2	19.7
1	1	1	3	1	22.0	21.3	20.0
1	1	1	3	1	21.7	21.1	20.3
1	1	1	3	2	21.1	21.4	21.9
1	1	1	3	2	21.3	21.6	22.5
1	1	1	3	2	21.3	21.3	22.6
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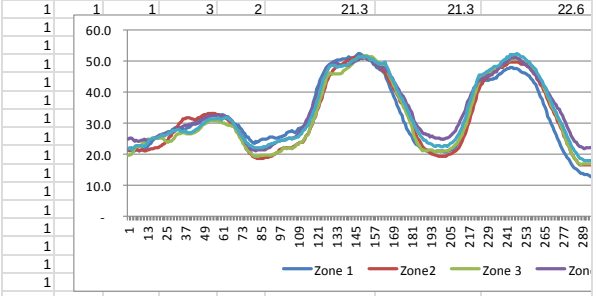
1	1	1	3	6	26.1	23.3	25.1



MAISY Marketing Analytics Solution #2: Engaging and Qualifying Sales Prospect

The MAISY Profiler Sales Assistant provides immediate battery/PV customer qualification providing vendors and potential customers with a business case assessment reflecting actual customer characteristics and load data from peer buildings in the MAISY Hourly Loads Databases.

*Market Analysis and Information System (MAISY) is the trademarked name for MAISY Utility Customer Energy Use and Hourly Loads Databases.

Attractive customer prospects can be followed up with detailed engineering analysis that applies the customer's actual load data provided by the customer's electric utility.

The Profiler Sales Assistant consists of an Excel Workbook interface that:

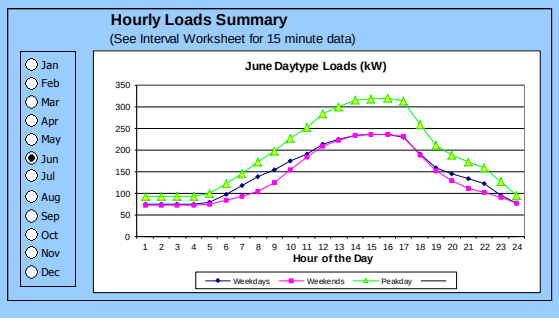
- Accepts user building specifications including the ZIP code
- Identifies the electric utility serving that ZIP code and accesses the appropriate electric rate structure
- Identifies buildings in the MAISY Utility Customer Hourly Load Database most closely matching potential customer characteristics,
- Returns the following information for the user-specified building:
    - 15-minute interval kW loads for a year
    - Monthly electricity billing data based on estimated customer loads and utility rate structures
    - Electric rate structure details
    - Summary electric load profile information (monthly kWh, peak kW, etc.)
    - Solar PV system output
    - Battery contributions to peak clipping, load shifting and load smoothing
- Provides business case analysis for alternative battery/PV system designs

Each Sales Assistant is application is customized to meet individual client needs. Example output tables and charts are show below.

Monthly summaries are calculated from interval loads. Interval load data are applied to utility rate structures to calculate monthly bills.

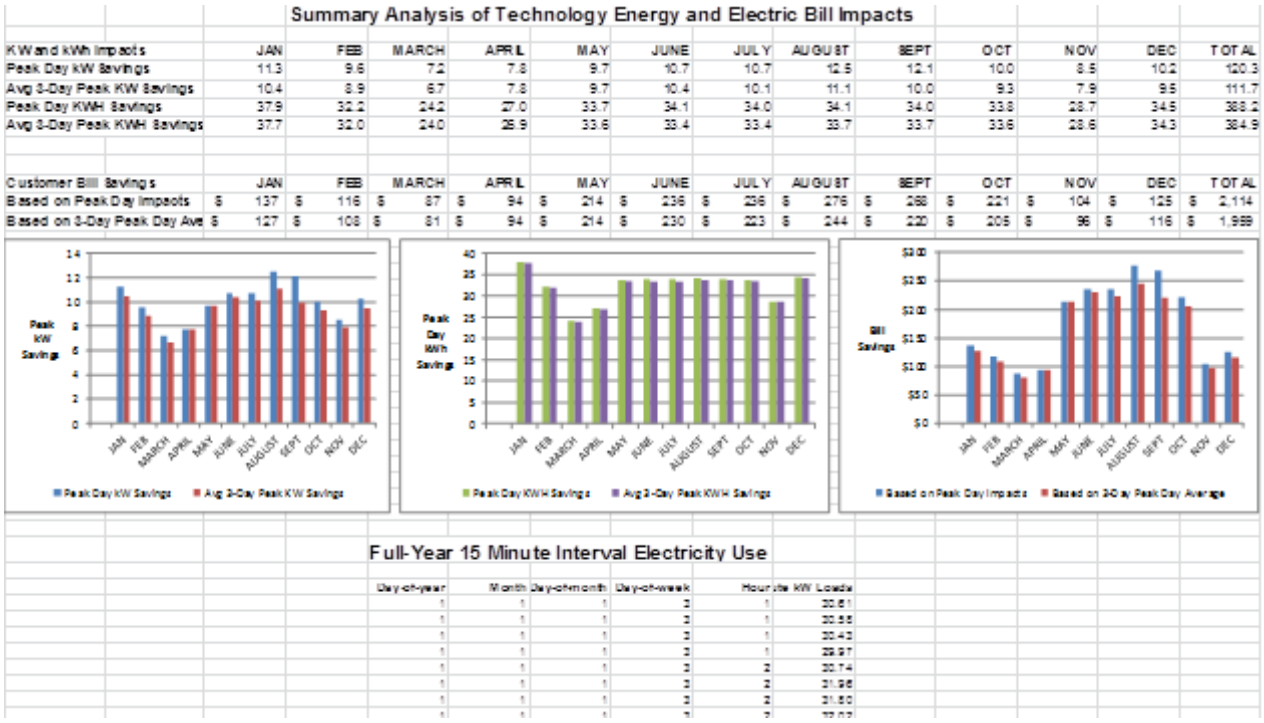
MAISY Profiler Marketing and Sales Assistant

Summary Customer Electricity Use and Bill Data



Month	Utility Monthy Electricity Use and Bills kWh	kW	Bill
January	92,384	332.0	$10,696
February	71,165	275.7	$8,620
March	78,991	264.1	$8,803
April	73,371	257.8	$8,409
May	85,340	239.8	$9,403
June	105,014	319.3	$13,675
July	127,417	386.9	$16,574
August	112,779	336.6	$14,539
September	88,351	265.3	$11,432
October	78,924	219.0	$7,987
November	75,358	265.1	$8,641
December	80,456	279.9	$9,161
Annual	1,069,552		$127,940

Technology impacts on maximum peak day load and kWh reductions for the peak day are presented as shown in the figure below. Additional data on number of days the storage system must be employed to achieve the peak demand reduction and other performance characteristics can be provided. Full year 15-minute electricity loads are presented for evaluation and application to client-provided analysis.



Additional Sales Assistant information is available at http://www.maisy.com/storagepv.pdf and http://www.maisy.com/storagepv.htm .

Summary

Combining battery storage with PV systems provides new commercial sector market opportunities for battery and PV systems. Battery outputs can be used to smooth PV impacts reducing peak demand charges beyond what can be achieved with PV alone. Battery storage also provides opportunities for peak load leveling, shaving and shifting. The example in this paper illustrates the ability of combined battery/PV systems to provide a synergy that reduces peak demand more than the sum of reductions achieved independently by the two technologies.

Battery/PV business case load profile impacts are illustrated with interval load data for medical offices in the SCE service territory for battery storage, PV and a combined storage/PV systems in medical office buildings in two geographic locations.

However, high commercial customer PV acquisition costs and long sales cycles present a challenge for battery/PV providers. This paper identifies two primary bottlenecks in the sales process associated with (1) difficulty in identifying the most profitable and receptive potential customers and (2) long delays in qualifying and engaging customers because of delays in obtaining customer interval load data from the utility and providing an initial sales proposal.

Two marketing analytics applications are presented to resolve these bottlenecks. Market segmentation is widely used to target attractive potential customers; however, the segmentation and analysis process required for battery/PV segmentation and targeting must include information on customer hourly loads characteristics. This extension requires application of a commercial customer database that includes 15-minute interval load data in addition to traditional firmographic data.

A "real-time" customer qualification and sales proposal process is presented as the second marketing analytics application. Providing potential customers with a business case assessment using actual customer characteristics along with interval load data from peer buildings extracted from a commercial customer hourly loads database

provides an immediate assessment for battery/PV providers and potential customers. The ability to quickly engage high-value prospects has been shown to significantly increase sales conversion rates.

Both marketing analysis solutions are illustrated with MAISY marketing analytics products developed to improve technology provider segmentation/target marketing and customer qualification/engagement.